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MONTHLY REPORT - DECEMBER 1977

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NOAA/NMFS

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SOUTHWEST FISHERIES CENTER
La Jolla, California

Honolulu Laboratory
La Jolla Laboratory
Tiburon Laboratory
Pacific Environmental Group

MONTHLY REPORT - DECEMBER 1977

STATUS OF PUBLICATIONS

Published

Seckel, Gunter R. and Marian Y.Y. Yong. 1977. Koko Head, Oahu, Sea-Surface Temperatures and Salinities, 1956-73, and Christmas Island Sea-Surface Temperatures, 1954-73. Fish. Bull., U.S. 75-767-787.

Sea-surface temperatures and salinities have been collected twice weekly at Koko Head, Oahu, Hawaii, since 1956; and at Christmas Island in the central equatorial Pacific, sea-surface temperatures have been collected daily since 1954. In 1971, Seckel and Yong used harmonic analysis as a curve-fitting method to bring these observations, 1 year at a time, through 1969, into a form useful for descriptive and numerical applications. In this paper the analyses are updated through 1973 and the method is used to describe the entire data series.

The data series have been separated into several scales of variability: long-term variability (periodicities larger than 1 year), short-term variability (12-month and shorter periodicities), average annual cycle (the 12-, 6-, 4-, and 3-month periods), and the residual variability that characterizes individual years (the short-term variability with the annual cycle removed). In contrast to the Koko Head temperature where the annual cycle predominates, the interannual variability predominates, at times obscuring the annual cycle, in the Koko Head salinity and Christmas Island temperature. The interannual change of the Koko Head salinity can be about three times, and that of the Christmas Island temperature can be about four times the average annual variability. In the average annual temperature and salinity cycles at Koko Head the amplitudes of the 6-, 4-, and 3-month periods are small in relation to the 12-month period. In the average annual temperature cycle

at Christmas Island, however, the amplitude of the 6-month period is almost one-half that of the 12-month period. The residual variations exhibit changing amplitudes and periodicities at intervals of more than 1 year that resemble amplitude and frequency modulations.

Speculations are made about processes that contribute to the temperature and salinity variations. It appears that in addition to the heat exchange across the sea surface, advection contributes materially to the observed changes at Koko Head and Christmas Island.

Harmonic coefficients resulting from the analyses are listed in the appendices to facilitate reproduction of the data presented.

Kitchell, James F., John J. Magnuson, and William H. Neill. 1977. Estimation of caloric content for fish biomass. Environmental Biology of Fishes 2:376-380.

Abstract.--Analyses of tissues from just-caught and captive, starved, skipjack tuna, Katsuwonus pelamis, indicated a significant effect of starvation on water, ash, and caloric content. Caloric content of just-caught whole fish was 1.45 to 1.48 kcal g^{-1} wet weight and was directly comparable to values determined for white muscle (edible) tissue samples. Examination of recent literature yielded caloric data for 81 fish species. These data plus those from our study indicated that the assumption 1 g wet weight - 1 kcal can result in substantial error. Less than 40% of the data were within the range 0.90-1.10 kcal g^{-1} wet weight. A linear relationship between caloric content (Y) and percent water (X) derived as Y=5.537-0.059X resulted in an overall improvement in estimation of caloric content.

Otsu, Tamio. 1977. The Far Seas Fisheries Research Laboratory and I--Recollections on tuna research (Enyo Suiken to watakushi--Maguro kenkyu no omoide). (In Jpn.) Enyo (Far Seas Fish. Res. Lab., Newsl., 10 anniv. ed., August 1977, p. 9-10.

Van Bree, P.J.H. and W.F. Perrin. 1977. On the diagnosis of the spinner dolphin, Stenella longirostris (Gray, 1828) and its holotype. Zoologische Mededelingen 52;255-259.

Approved by the Center Director

Butler, John L. The nomeid genus Cubiceps (Pisces) with a description of a new species. For publication in the Bulletin of Marine Science.

Zweifel, James R. A non-linear model for allometry in larval fish. For publication in Biometrics.

Moser, H. Geoffrey and Elbert H. Ahlstrom. Larvae and pelagic juveniles of the black gill rockfish Sebastes melanostomus, taken in midwater trawls off southern Calfiornia and Baja California. For publication in the Journal of the Fisheries Research Board of Canada.

Powers, Joseph. A goal programming model to investigate allocation of porpoise/tuna resources. For publication in the Journal of the Fisheries Research Board of Canada.

Eber, L.E. Time series charts of temperature, salinity, oxygen and sigma-t at 0-200 meters, 1950-1966 for 23 stations in the California Current. For publication in California Cooperative Oceanic Fisheries Investigations Atlas.

Alvarino, Angeles. A new species of Spadella from Hawaii (benthic Chaetognatha). For publication in Pacific Science.

Echeverria, T. Uptake, storage and depuration of ^{14}C benzene in the rotifer, Brachionus plicatilis. For publication in the Journal of the Fisheries Research Board of Canada.

Smith, S.E. and S. Kato. San Francisco Bay fisheries--past, present and future. Submitted to Proc. San Francisco Bay Symposium held June 13, 1977.

Mendelssohn, Roy. Harvesting with smoothing costs. For publication in Operations Research.

Yoshida, Howard O. Biology and resources of the little tunas, Euthynnus spp. For publication in U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ.

HONOLULU LABORATORY

RESOURCE ASSESSMENT AND DEVELOPMENT INVESTIGATIONS (RADI)

Cruise to Conduct Fish Aggregation Experiments Completed

The NOAA research vessel, Townsend Cromwell returned to Honolulu on December 17 after a 30-day cruise to equatorial waters in the vicinity of Palmyra Island. The purpose of the cruise was to study the effectiveness of artificial drift objects to attract fish schools, particularly tuna schools. This study is being conducted in cooperation with the Pacific Tuna Development Foundation.

Chief Scientist Walter M. Matsumoto reported that a series of rafts, spaced about 1 mile apart and connected by a line 5 miles long, was set adrift 285 miles northwest of Palmyra Island and followed for 16 days. Each raft measured 4 x 12 ft and had a 2-ft strip of rope netting either 50 or 100 ft long suspended from it to simulate a log floating vertically in the water. The rafts were monitored daily for accumulation of fish under them, and area of up to 6 miles from the rafts was scouted for bird flocks and fish schools.

Two bird flocks appeared in the vicinity of the rafts on the third day and a total of 17 bird flocks was seen from the third through the eleventh day. None were seen in the last 5 days due to poor visibility caused by the onset of bad weather conditions. Two of the bird flocks were pursued and the chase led to two fish schools, one of skipjack tuna, the other of skipjack tuna and small yellowfin tuna. All fish schools and bird flocks except one were seen within 3 miles of the rafts, suggesting that the rafts may have been effective in attracting the schools.

In addition to Matsumoto, the scientific field party included Research Assistants Thomas K. Kazama and Robert B. Moffitt.

Study Initiated on the Size Composition of Hawaiian Skipjack Tuna

Mr. Fletcher V. Riggs, Fishery Biologist at the Honolulu Laboratory, has begun a study of the size composition of the skipjack tuna landed in the Hawaiian skipjack tuna fishery. This study will utilize the extensive size-frequency data collected by the Honolulu Laboratory to 1) determine the modal groups comprising the fishery, 2) produce an age-length key, and 3) compute other size related statistics.

Initially, Riggs has started work on establishing and checking the integrity of the data base. Riggs has also completed a summary report for 1976 and 1977 at the request of the Director's Office.

International Billfish Stock Assessment Workshop Held at Honolulu Laboratory

An international workshop sonsored by the Honolulu Laboratory, including financial assistance from the Western Pacific Regional Fishery Management Council (WPRFMC), was held from December 5 to 9 to assess the status of the Pacific billfish stocks. Contributions were made by participants from the Honolulu and La Jolla Laboratories, SWFC, the Miami Laboratory, SEFC, the California Department of Fish and Game, the Far Seas Fisheries Research Laboratory, Japan, the National Taiwan University, the Republic of Korea Office of Fisheries, and the International Commission for the Conservation of Atlantic Tunas. The workshop marked the

first attempt at a comprehensive analysis of billfish stock dynamics and the effects of fishing on stock productivity and yield. Particinpats from Honolulu Laboratory Director Richard Shomura, Dr. Jerry Wetherall, Leader, Fishery Management Research Task; Heeny Yuen, Leader Recreational Fisheries Task; and Marian Yong, Mathematician. Attending from the La Jolla Laboratory were Fishery Biologists Gary Sakagawa, James Squire and Norman Bartoo.

Because information on the catches, size and age composition of billfish stocks is generally not available, stock assessments were based on surplus production models, using catch per unit effort statistics from the Japanese tuna longline fishery and estimates of total Pacific catch. The first week of the workshop was devoted to assessment of Pacific billfish stocks and the second week was devoted to assessment of Atlantic billfish stocks. The detailed report which follows was prepared by the staff of the Tuna Resources program at the SWFC.

Dr. Sakagawa presented an appraisal of stock condition of Pacific swordfish based on production model analysis. Results of the analysis, with the assumption of an eastern stock and a western stock in the Pacific indicated a maximum sustainable yield (MSY) of about 8,000 MT for the eastern stock and about 12,000 MT for the western stock. Current total catches from the eastern and western Pacific are well below these MSY levels, primarily because longline boats, which land the bulk of the catch, currently do not fish at night when longlining for swordfish is most effective.

A review of estimates of population dynamics parameters for Pacific and Atlantic billfish was presented by Dr. Bartoo. Estimates for age/size at maturity, fecundity, growth and mortality were presented for sailfish, broadbill swordfish, blue marlin, striped marlin and black marlin of the Pacific; and for sailfish, broadbill swordfish, blue marlin and white marlin of the Atlantic.

The following table summarizes the ranges of estimates for growth equation parameters (Von Bertalanffy's K) and annual instantaneous natural (M) and total (Z) mortality rates that were presented at the workshop.

Species	Pacific Ocean			Atlantic Ocean		
	K	Z	M	K	Z	M
Sailfish	0.472*		0.89*	0.901		1.73
Spearfish						
Broadbill Swordfish	0.124		0.22*	0.230	0.12-0.65	0.21-0.43
Blue Marlin						
Males	0.29-0.81		0.53-1.56			
Females	1.23-1.75		0.15-0.21			
Black Marlin	0.474*					
White Marlin					0.25-0.45	
Striped Marlin						
Males	0.31-0.42	1.38-1.94	0.59-1.55			
Females	0.69-0.70		1.33-1.36			

* Estimates added during workshop

The review showed that estimates of growth parameters and mortality rates needed for advanced assessment analyses, were lacking for many species or were at best first approximations.

Results of NMFS' Cooperative Billfish Tagging Program in the Pacific, data on size composition of striped marlin caught by the southern California and Mexican sportfisheries, and trends in catch-per-unit-of-effort for important sportfishery areas in the Pacific were presented by Mr. Squire. A total of 13,883 striped marlin, 3,129 black marlin, 409 blue marlin and 5,953 sailfish were tagged in the Pacific during 1954 through 1976. From these releases a total of 188 striped marlin, 52 black marlin, 11 sailfish and 1 blue marlin has so far been recovered.

Data on weight of striped marlin caught by the southern California sportfishery indicates little change over a 31-year span. Average weights by year ranged from 132 to 158 lbs. The overall average for the 31-year period is 144 lbs. Billfish angler catch-per-day's fishing, as determined by an annual postcard survey shows striped marlin rates in the primary producing area off Baja California, Mexico, declined in 1969 through 1973 with a slight recovery to a near stable level in 1974-1976. Sailfish catch rates have fluctuated widely but have shown an upward trend since 1973. Black marlin annual catch rates off Australia have fluctuated from 0.2 to 1.5 fish per day. In 1975 and 1976 the rate was about 0.7 fish per day.

Results of analyses and discussions at the workshp are being assembled by Richard Shomura, Director of the Honolulu Laboratory, and Dr. Grant Beardsley of the Miami Laboratory in reports that will be available for distribution. The reports will include the finding that

the Pacific blue marlin stock appears to be overfished in a biological sense. Fishing effort levels at present are approximately one-and-one-half times greater than that needed to produce the MSY of 22,000 MT.

Swordfish of the Pacific Ocean was estimated to have an MSY of 20,000 MT when considered on a Pacific-wide basis. Recent catches are near 14,000 MT at lower efforts than required for MSY. The conclusion of the workshop participants was that the stock appears to be in good condition.

The striped marlin population of the Pacific Ocean consists of a North and a South stock. MSY for the respective stocks is 17,000-31,000 MT and 6,000-7,000 MT. Current catches are about 12,000 MT from the North Pacific and 4,000 MT from the South Pacific with fishing effort less than required for MSY's. These stocks, therefore, appear to be in good condition.

No accurate appraisal of the state of the stocks for black marlin, shortbill spearfish or sailfish of the Pacific was possible because of insufficient or inadequate fishery statistics. However, the participants reviewed available data and information that suggested black marlin may be heavily exploited, shortbill spearfish appear to be abundant and in good condition, and sailfish in the western Pacific appear to be heavily exploited while the eastern stock appears to be in better condition.

The Atlantic assessment session resulted in the following stock appraisals. The white marlin stock in the North Atlantic is being fished at about the level of MSY, 2,100 MT, and the stock appears to be in good condition. Other white marlin stocks were not assessed because of insufficient data.

The catch of blue marlin from the north Atlantic is currently about 4,000 MT. The stock appears to be exploited near an MSY level judging from analysis of trends in catch-per-unit-of-effort and fishing effort.

Adequate information on swordfish of the Atlantic were not available at the meeting to develop an accurate assessment. The participants felt, however, that because of the collapse of the Canadian fishery owing to the mercury problem in swordfish, and the reduced number of night sets by longliners the stocks are in good condition and capable of sustaining the current catch of about 7,000 MT.

No assessment was made for shortbill spearfish and sailfish of the Atlantic because of insufficient data and information.

Pictured above are the participants in the billfish stock assessment workshop. Front row from left to right: Dr. Gary Sakagawa, Mr. James Squire, Mr. Richard Shomura, Dr. Shoji Ueyanagi, Mr. James Zuboy, and Mr. Ziro Suzuki. Back row, left to right: Mr. Ramon Conser, Mr. Peter Miyake, Dr. Rong-Tszong Yang, Dr. Norman Bartoo, Dr. Jerry Wetherall, Mr. Jackson Davis, South Atlantic Regional Fisheries Management Council, Mr. Heeny Yuen, and Dr. Grant Beardsley.

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Dr. Robert A. Skillman, as Coordinator of the Cooperative Study of the Northwestern Hawaiian Islands, completed editing and revising the "Survey and assessment of the living resources of the Northwestern Hawaiian Islands, a tripartite cooperative agreement," after obtaining input from the cooperating agencies. The agreement has been typed in final and will be sent out the first part of January for signature by the Director, NMFS, Director, USFWS, and the Hawaii Board of Land and Natural Resources.

As Chairman of Honolulu Laboratory's Vessel Committee, Skillman revised the cruise schedule of the Townsend Cromwell for FY 1978 and 1979. Dr. Skillman also attended a meeting of the Fishery Information System (FIS) Advisory Committee in La Jolla. The purpose of the meeting was to review the progress of the contractor, Potomac Research Inc., toward the preparation of an FIS issue paper.

* * * * * * * * * *

Mr. Richard N. Uchida, Leader, Insular Resources Task, completed the Narrative Report for cruise TC 77-03 (TC-76) and drafted by 1980 TDP's for the Insular Resources Task. He also gathered background information on Guam and the Northern Mariana Islands in preparation for a fact-finding trip in early 1978 and a research cruise tentatively scheduled for May 6-July 10, 1978 to these areas.

Other members of the Task made preparations for the next cruise to the Northwestern Hawaiian Islands. Research Assistants Paul Shiota, Martina Queenth, Darryl Tagami and Glenn Higashi worked with Thomas Hida, Fishery Biologist, repairing and fabricating fish traps and lobster pots, and assembling other biological sampling gear in preparation for Townsend Cromwell cruise 78-01 (TC-78) Part II.

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Mr. James Uchiyama, Fishery Biologist, traveled to La Jolla to aid in setting up an otolith laboratory at SWFC La Jolla Laboratory.

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Research Assistants Jose Enitan and Jeff Sampaga terminated work on Atlantic skipjack tuna otoliths, which is being taken over by the La Jolla Laboratory. They began processing otoliths collected from lutjanids caught in NWHI waters.

Estimated 1977 Total Catch of Skipjack Tuna Below Long-Term Average

The November 28 to December 31 Hawaii landings of skipjack tuna were estimated at 147 metric tons (MT), which is 241 MT below the lanidngs for the same period in 1976 and 3.0 MT greater than the 1948-76 long-term average for the same period. The cumulative landings from January through December 31 were estimated at 3,458 MT, which is 186 MT below last year's landings for the same period and 886 MT below the 1948-76 long-term average for the same period.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

ALBACORE FISHERIES INVESTIGATION PROGRAM

Reports of Cooperative Albacore Research Studies Available

Two reports dealing with albacore research and exploration studies conducted cooperatively by the La Jolla Laboratory and the American Fishermen's Research Foundation (AFRF) were completed by the staff of the Albacore Fisheries Investigation in November.

Dr. R. Michael Laurs and Robert Nishimoto prepared a report concerning: 1) cooperative NMFS-AFRF albacore scouting and research activities conducted during the 1977 season (except late-season activities, see below), 2) a summary of the joint NMFS-AFRF albacore tagging program, 3) information about albacore migration learned from the cooperative tagging program, and 4) results obtained from studies of the food habits of albacore caught in offshore waters during early seasons of 1972-1977.

In addition, Laurs completed a report dealing with albacore trolling exploration in the western North Pacific conducted in 1977 by two jig vessels on charter to AFRF and the Pacific Tuna Development Foundation (PTDF). A major objective of the survey was to evaluate the feasibility for jig fishing of albacore in the western North Pacific, especially in the vicinity of the Emperor Seamount chain. Secondary objectives were to gain information for use in migration studies of North Pacific albacore and the association of albacore with oceanographic features. Copies of both of these reports were distributed to approximately 700 albacore fishermen belonging to the Western Fishboat Owners Association and the board of directors of AFRF, and are available to albacore fishermen and members of the albacore fishing industry or others who may request them.

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Dr. Michael Laurs, Leader of the Albacore Fisheries Investigation at the La Jolla Laboratory, gave a presentation dealing with the results of the joint NMFS-AFRF albacore research studies to the annual general meeting of the Western Fishboat Owners Association held in San Diego in mid-December. His talk included a review of albacore research and scouting activities carried on off the west coast during the 1977 fishing season and in the western Pacific, conclusions and hypotheses

concerning albacore migration and stock structure based on data resulting from the joint NMFS-AFRF studies, and a review of the 1977 fishing season. The talk was well received by the approximately 200 fishermen who attended.

Laurs also gave a similar presentation to the AFRF board of directors meeting held in San Diego in mid-January. In addition, he participated in a planning session for AFRF albacore research studies.

NOAA Corps Officer Assigned to Coastal Fisheries Division

Lt. David McConaghy of the NOAA Corps was assigned to the Coastal Fisheries Resources Division of the La Jolla Laboratory on December 23, 1977. His overall supervisor will be Division Chief Reuben Lasker; his immediate supervisor, Dr. Michael Laurs.

Lt. McConaghy's main assignment will deal with application of ocean measurements by satellites to fisheries research. This will involve determining what satellite-derived ocean products are available, which ones may be useful to fisheries research and management, and how these products may be used. In addition to this assignment, he will also assist in the development of software for the data acquisition system to be placed aboard the NOAA research vessel Jordan.

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In accordance with a NMFS contract with the Inter-American Tropical Tuna Commission, Robert Kirkham delivered preliminary versions of NOAA satellite-derived sea surface temperature charts. Oceanographer R. Lynn of the Albacore Fisheries Investigation program worked with Kirkham to experiment with filtering and contouring schemes to enhance the clarity of the temperature fields. Kirkham has chosen to provide charts using a contoured presentation as well as a gray-scaled one for evaluation. This type of product could significantly contribute to the program's evaluation of data obtained during the 1978 CalCOFI cruises.

A final report for the calendar year 1977 contract will be delivered to NMFS in January 1978.

CTD Data Acquisition System Revised

Oceanographers R. Lynn and K. Bliss and NOAA Corps Officer Lt (jg) M. Sullivan of the La Jolla Laboratory, completed revisions to the Hewlett-Packard system controller/CTD data acquisition system. Additional tape drives and frequency counters were added. The additional tape drives provide improved safety from inadvertent data loss--each data

transfer routine has its own channel. The additional drives also provide backup in case one or more drives fail. The additional frequency counters allow a greater resolution of data measurement at a high rate of sampling.

Lynn believes that this system now has an equivalent data collection power for the CTD system to any of the large computer systems installed aboard research vessels. This desktop H-P computer is considerably faster and has greater capacity than other or earlier model desktop computers that have been interfaced to CTD data acquisition systems.

Sullivan completed assembly of the interfacing units into an instrumentation cabinet. Lynn arranged for changes in the interfacing control programming to accommodate the new additions and wrote an instruction manual. Bliss completed changes in the data processing programs and streamlined the operation procedures. The system will be used on the January CalCOFI cruise in which Bliss and Sullivan will participate.

Sullivan has also checked out the new Guideline salinometer. He and Lynn worked out a feedback problem in the salinometer/computer interface. Bliss programmed the H-P system to receive and process the salinometer output.

Chartered Albacore Jigboats Conduct Tagging & Scouting Operations

Four albacore jigboats chartered to the American Fishermen's Research Foundation and working cooperatively with the staff of the Albacore Fisheries Investigation at the La Jolls Laboratory conducted albacore tagging and scouting operations off central and southern California in November.

An important objective of the operation was to gather data for investigation of the migration route(s) of the "southern" group of fish that comprise the U.S. albacore fishery. These boats sailed from San Diego on November 1 and returned to Moss Landing, California on November 30.

Catches were made almost daily from San Diego to 135°30'N longitude and northward to 37°N latitude, but few scores of more than 100 fish per day per boat were recorded. Fishermen on the boats, however, indicated that a large body of fish was present in an area at 35-37°N latitude, 131-133°W longitude, and near the location of best catches during the cruise.

The data collected on the chartered cruises are being processed by Steven Orloff, Student Intern from San Diego State University, who will be working under Nishimoto's supervision through June.

LARVAL FISHES, COASTAL E. PACIFIC

Student Intern Completes Research Project on Larval Feeding

Dr. Hunter, Fishery Biologist at the La Jolla Laboratory, reports that John Finger, a senior from Southampton College, New York, completed his student internship this month under his supervision. Finger assisted in various tasks in the laboratory and field in the first months, including an albacore tagging cruise. During the latter portion of his stay, he was assigned a research project, the objective of which was to estimate ration, growth efficiency, and food selectivity of anchovy larvae fed the rotifer Brachionus and Artemia nauplii over the first 20 days of larval life.

The results indicate that the rate of gut filling and evacuation changes with length in larval anchovy. Small larvae (4.6 mm) fill their gut more slowly than larger larvae; contents of the gut in the smaller larvae increased steadily, almost in a linear fashion, throughout the day; and in larger larvae (9.3 mm), gut contents increased sharply over the first hour of feeding and thereafter showed only a minor increase during the rest of the 12-hour feeding day. The rate of evacuation of the gut declined with length; for example, the rate of elimination for a 4.6 mm larvae was 5.6 Brachionus per hour and was only 2.31 per hour for 8.5 mm larvae.

During the first 5-10 days of life, larval anchovy consumed about 2-4 times their body weight of Brachionus per day but after 12 days of age (length, 7 mm), ration was equivalent to about their body weight per day. Food was abundant in these experiments and consequently the gross growth efficiency would be higher under natural conditions. The mean growth efficiency on a dry weight basis for larvae fed Brachionus was 15% (± 3.7%) but ranged upward to 27%.

Food size selectivity was tested by offering anchovy larvae grown on a diet of Brachionus, a combination of Brachionus (133 m diameter) at 10/ml and Artemia nauplii (240 m diameter) at 1/ml and counting the numbers of each type of prey eaten. Anchovy showed a strong positive selection for Artemia when the mouth width was twice as large as the prey (prey width/mouth width = 0.5). Hunter showed previously that the threshold at which 50% of anchovy larvae are capable of ingesting one or more Artemia nauplii is at a prey width to mouth width ratio of

0.77. Thus, anchovy larvae showed a positive selection for a larger prey when the ratio was slightly less than that necessary for capture and ingestion. At the 50% threshold for capture, larvae would select smaller prey if available.

Nutritional Role of Green Alga in Survival and Growth of Anchovy Larvae Investigated

Dr. Nancy Moffatt, NOAA/NRC postdoctoral Fellow at the La Jolla Laboratory, continued her work on the effects of low food densities on the survival and growth of northern anchovy (E. mordax) larvae. Wild-caught and size-graded zooplankters (primarily copepod nauplii, copepodites and adults) were fed to first-feeding larvae at densities of 150/l and 100/l reared in glass tanks containing dense blooms of the green alga Chlorella (9,000 to 17,000 cells/ml). Inadvertently, however, barnacle stages flooded two of the experimental tanks in each of the two experiments. Table 1 summarizes the results of these experiments.

E. mordax larvae survived at zooplankton densities substantially below those found necessary for survival and growth in prior investigations. The differences between Moffatt's work and past studies was the use of lower stock densities and the presence of Chlorella in the rearing system. These experiments indicate that growth and survival is improved when Chlorella is present in addition to zooplankton, but larvae do not survive on Chlorella alone. Moffatt had three possible explanations for this: first, that Chlorella acts to improve the water chemistry in the rearing tanks, second, that the presence of the algal cells improves the nutritional condition of the principal food, the zooplankton, and third, that the alga is actually ingested and assimilated by the larvae directly.

Moffatt believes that while all three may be occurring, the second is probably most influential in these experiments. The zooplankters sampled daily from the rearing tanks with Chlorella were green in color, indicating that they were well-fed. Inspection of larval guts revealed that they contained green zooplankters in addition to a homogenus green soup of Chlorella cells. Whether the larvae are capable of complete assimilation of Chlorella or not, the larvae do ingest the algal cells and they are subjected to digestive processes. And, although not conclusive, no pH differences were noted between the tanks during the experiments. It appears, therefore, that Chlorella plays a nutritional role in the survival and growth of these larvae when present in bloom concentrations in conjunction with low zooplankton levels.

Table 1. Summary of the E. mordax rearing experiments - low food densities.

Chlorella bloom Present			Chlorella bloom Absent	
Zooplankton levels			Zooplankton levels	
0/l	100/l	150/l	100/l	150/l
		Percent Survival		
0	45	39	0	1
0	44	44	6	4
	59[1]	64[1]		
	60[1]	84[1]		
		Mean length after 15 days (mm)		
-	5.4	8.7	-	4.5
-	6.8	7.3	6.2	5.6
	7.2[1]	8.8[1]		
	7.4[1]	9.7[1]		

[1]Indicates barnacle contamination.

Laboratory Experiments to Define Condition Factors Extended to Anchovy

In a continuing effort to define parameters that identify the condition of sea-caught fish larvae and that can also be easily and routinely measured, Ms. Gail Theilacker, Fishery Biologist at the La Jolla Laboratory, has extended her laboratory experiments to include anchovy larvae. Dr. Charles O'Connell has shown previously that feeding and starving anchovy larvae can be identified histologically. Theilacker found that both histological and morphological techniques identify the condition of jack mackerel larvae and that the morphological method was easier than the histological one, required less time, and was equally successful. Morphometric characters, as indicators of condition, have never been fully trusted for use with elongate-clupeoid (anchovy-like) larvae; however, most studies have only tested single morphometric parameters.

Since the multivariate statistical approach combining five morphometric measurements was successful in identifying jack mackerel larval condition (deep-bodied larvae), a similar set of experiments was performed to test the technique with anchovy larvae.

Anchovy were reared in 100-liter tanks at 15.5°C. Larvae in two of the tanks were fed to time the onset of feeding and feeding was delayed 1 to 5 days in the other tanks. Larvae in one tank were maintained on a low density diet. Twenty to 30 larvae were sampled daily from each tank for 2 weeks. With the help of Biological Technician Jack Metoyer, five morphometric parameters will be measured on each larvae.

The 1- and 2-day starved anchovy started feeding immediately after food was added to the tank. However, larvae in the tank starved 3 days, delayed feeding activitiy 15 to 20 minutes. No feeding was noted in larvae starved 4 days after food was added; however, on the following day a few 4-day starved larvae were feeding. Five-day starved larvae did not feed. Anchovy larvae withstood starvation (and still fed when food was available) 1 day longer than Pacific mackerel and 2 days longer than jack mackerel reared in similar laboratory experiments and at the same temperature.

SURVEY SYSTEMS DEVELOPMENT AND EVALUATION PROGRAM

New CalCOFI Bongo Net Performance Compares Favorably with Standard CalCOFI 1-Meter Ring Net

Dr. Paul E. Smith, Fishery Biologist at the La Jolla Laboratory, has completed the analysis of the performance of the new CalCOFI Bongo net as compared to the old standard 1-meter CalCOFI ring net. Using data collected this month, Dr. Smith has concluded that the new Bongo net is equal to the old CalCOFI net in terms of depth-specific volume of water filtered and in the ability of scientists to control the trajectory. The Bongo net has the advantage of collecting two samples simultaneously and providing an unobstructed mouth opening, thereby permitting capture of organisms which normally avoid a net bridle.

Smith has data which show the average volume of water filtered by each net along with precision estimates on variations that can be expected at any depth with any tow. This technical analysis was developed by Smith to provide intercomparisons with old and new data and finds further utility in permitting ship personnel to adjust their operating procedures to the new net.

MULTISPECIES TAXONOMY PROGRAM

Work continued in this program on the identification of fish larvae taken in CalCOFI plankton samples during 1975. Still remaining to be completed are parts of two cruises, CalCOFI 7505 and CalCOFI 7510-11.

Fishery Biologist John Butler participated in a cruise aboard the Scripps research vessel, Humboldt, which unfortunately developed a serious oil leak after completing only two CalCOFI lines on their assigned portion of the CalCOFI pattern, and was forced to return to San Diego for extensive repair.

Biological Technician E. Stevens participated in the December cruise of the NOAA research vessel, Jordan, which completed most of its assigned stations. This cruise was the first in the "1978" CalCOFI year of biological and oceanographic sampling of the California Current area.

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

Workshop Convened to Review Acoustical Technology and Survey Design for Estimating Anchovy Biomass

The Anchovy Plan Development Team is exploring alternative ways of estimating anchovy biomass annually using available methods and technologies. As a part of this effort, a workshop was convened December 9 at the La Jolla Laboratory, to review acoustic technology and survey design for estimating anchovy biomass to determine whether an acoustic survey is practical for estimating biomass in the foreseeable future and to outline alternative designs and biomass estimation procedures for such a survey. Drs. Ole Mathisen and Richard Thorne, from Fisheries Research Institute, University of Washington, discussed application of echo integration technology for estimating biomass of Peruvian anchoveta and other species around the world. Ken Mais, from California Department of Fish and Game, reviewed prcedures of their side scanning sonar and midwater trawl surveys, which count anchovy schools. Dr. Paul Smith of the La Jolla Laboratory reviewed acoustic research on species identification and fish size measurements. The meeting was chaired by Alec MacCall, California Department of Fish and Game (CF&G), Marine Biologist. A report of the workshop is being drafted by Keith Parker, Gary Stauffer and Alec MacCall; a final report will be completed in January.

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Dr. Gary Stauffer of the La Jolla Laboratory has completed the review of Pacific saury literature and has begun writing the Preliminary Fishery Management Plan. The first draft is scheduled to be completed

in January. Based on the experience of the Japanese exploratory fishing operations in early 1970's, a foreign fishery would be most successful off Oregon and Washington in the late summer and early fall. Optional foreign catch levels have not yet been determined.

Draft of Fishery Management Plan for Squid in Preparation

Economists Dan Huppert and Jane McMillan of the La Jolla Laboratory who are preparing the conomic section of the forthcoming preliminary draft management plan for squid attended the Squid Advisory Panel meeting at the California Department of Fish and Game Laboratory at Long Beach on December 1. In a report on the results of the meeting, McMillan noted the following highlights.

There was some question of whether or not the market and squid, Loligo, should be considered as under the jurisdiction of the Pacific Fishery Management Council. Much of the squid that is caught within 3 miles of the shore is under the jurisdiction of the state of California. Since a foreign fishing application for squid has been received from Taiwan, however, it is necessary to develop a fishery management plan. Herb Frey, CF&G, discussed the various current laws and regulations pertaining to squid.

Mr. Jim Hardwick of CF&G presented a description of the squid fishery, tracing its history from the Chinese fishery in the late 1800's to the lampara and light fishing of Monterey and San Pedro today. There was some discussion among the fishermen in the group attending the meeting as to the relative pros and cons of the various fishing methods. The San Pedro light and brail fishermen had strong feelings that nets dragged across the bottom will upset eggs. The Monterey lampara fishermen were adamant about maintaining their place in the fishery through the continued restriction of light fishing.

Dr. William Pearcy, Oregon State University, described the variety of squid stocks found off the Pacific coast. Dosidicus has been little studied. It has occurred off the California coast for several consecutive years at intervals of 10 to 15 years. When it does appear, it is a target of recreational fishermen, with about 1,000 tons being landed commercially. A Japanese exploratory vessel took 50 tons of these jumbo squid in 1977. Frey had originally suggested an allowable catch of 3,000 metric tons of Dosidicus, but now is thinking of allowing greater amounts to be taken in the years that it comes ashore. There was some discussion that some foreign permits would be granted for this offshore species.

In addition to Dosidicus, there are 40 to 50 different species of offshore squid. Most are small and probably of little commercial importance. Many are known only through the examination of the stomach

contents of marine mammals and birds. The options considered by the panel concerning these various species were: 1) to leave them unexploited to serve their natural place in the food chain (where they are a food for marine mammals, albacore, and other fish of commercial and recreational importance); encourage exploratory fishing to determine exactly what is in the ocean; and 3) permit exploratory fishing with certain restrictions.

The use of squid as bait in the recreational fishery was discussed. Recreational vessels catch squid with light and brails, some being sold as live bait. It is a desirable bait, especially for yellowtail.

Huppert described the economics of the squid fishery, discussing the domestic and export markets. The majority of canned squid is exported to Greece and the Philippines, while most of the frozen squid is exported to the countries of the Far East.

With the addition of the vessel information, the collection of all published and/or administratively available economic data on the squid fishery is complete. Leo Penhas and other CF&G personnel were most helpful in the data collection.

The next Subpanel Workshop was tentatively scheduled for February 22 in Long Beach when the preliminary first draft of the plan will be reviewed.

Partyboat Studies

During the month of December, the questionnaire forms for the partyboat passenger survey were reviewed, and Al Zangri of the Center for Natural Areas made modifications to the form. Also, an informal visit by Claude and Nina Gruen resulted in an agreement to alter the sampling scheme for the partyboat owner/operator survey. The new format calls for a screening survey of all registered partyboat owner/operators in California, followed by detailed personal interviews of selected vessel owners.

Oceanic Fisheries Resources Division

PORPOISE/TUNA INTERACTION PROGRAM

Preliminary Results of Porpoise Oceanography Cruise Aboard Jordan Reported

A report has now been completed by Dr. David Au, Fishery Biologist, and Lt. Wayne Perryman, NOAA Corps Officer assigned to the La Jolla Laboratory, on the preliminary results of their cruise to the south of

the Galapagos Islands which took place October 3 to November 21 aboard the NOAA research vessel, David Starr Jordan. The objective of the cruise was to determine the effects of the fall intensification of zonal currents in the eastern tropical Pacific, and of winter conditions south of the Galapagos Islands on distribution of dolphin species. Specifically, Dr. Au and Lt. Perryman proposed to look at the distributions of porpoise in the region of the equatorial front (the region of rapid surface temperature change).

After departure the Jordan worked eastward on the first leg, generally zig-zagging between the equator and 5-7°N, then dipping south to arrive at Callao, Peru on October 26. On October 30, the Jordan left Peru, working westward below the equator in the Peru and South Equatorial currents, to 111°W, before heading north to San Diego. In all 196 separate cetacean sightings were logged, including sightings of 75 whales.

Spotted and spinner dolphins were noted frequently along the equatorial front just north of the equator, suggesting that these animals may find frontal conditions advantageous. A total of 34 sightings of these two dolphin species were seen in waters north of the equator. In the cold tongue of water south of the equator that represents the westward extension of the Peru Current (Peru-South Equatorial Current) only 7 sightings were logged, some in surface temperatures down to 21°C (70°F). However in these same waters, striped dolphin, Tursiops, Globicephala, and Grampus were common.

Comparing the distribution of dolphin species to those reported on the Jordan in January-February of 1977, the present observations, according to Dr. Au, suggest that spotted and spinner dolphins at least may be attracted to frontal areas bordering the Peru Current extension. They were thus encountered mainly north of the equator along the equatorial front. In southern waters they were seen in frontal areas along the south and southwest margins of the Peru-South Equatorial Current.

No spotted, spinner, or striped dolphins were seen west of 100°W, south of the equator. In contrast during January-February these waters were noted to have much more biological activity, e.g., frequent bird flocks. Spotted and spinner porpoise were seen to 110°W and striped dolphin to 125°W at that time.

Mortality of Porpoise in 1977 Below NMFS Quota

Weekly reporting of cumulative porpoise mortality data was terminated by the Center on December 11, 1977 when it became obvious that the quota for the year would not be exceeded. Porpoise mortality was approximately 26,500 animals while the 1977 quota was approximately 62,500.

Porpoise Life History Group Completes Processing of 1977 Ovary Samples

Virtually all 1977 spotter dolphin and spinner dolphin ovaries received from about 110 vessels by the end of the year have been processed. The first draft of a procedures manual for processing biological samples obtained from porpoise has been completed. This manual will facilitate training new personnel and help assure uniform processing of specimens. Verification of nine more 1977 observer logs has been completed. This verification by an experienced field scientists is necessary to check on observer accuracy in identifying animals and to be certain that the correct sightings codes will be entered in the computer data base.

Center Well-Represented at Marine Mammal Conference

The Southwest Fisheries Center was well represented at the second annual Marine Mammal Conference, sponsored by the U.S. Marine Mammal Commission, held in San Diego December 12-15. Dr. William Perrin delivered a paper on spinner dolphins in the Atlantic, Dr. Eric Barham and Dr. Joseph Powers discussed logistic considerations and analytical procedures and results of the aerial survey of porpoise populations. Dr. Terry Quinn, a consultant on the aerial survey discussed aspects of the line transect theory as it applies to aerial surveys. Dr. David Au discussed his collaborative work with Lt. Wayne Perryman on the oceanography of pelagic dolphins. Dr. Kenneth Norris delivered a paper co-authored with Dr. Warren Stuntz on the behavior of spotted and spinner dolphins. Dr. Vincent Gallucci, who is under contract to the Southwest Fisheries Center to design a porpoise tagging study, delivered a paper on statistical aspects of the use of mark recapture techniques for determining the abundance and movement of porpoise.

Program Manager Selected for Dedicated Vessel

Mr. John DeBeer, formerly of Living Marine Resources, Inc., of San Diego, has been selected as program manager for the dedicated vessel. The vessel, the Queen Mary, together with a crew, is being provided for one year by the U.S. Tuna Foundation for research into the porpoise/tuna problem. Planning meetings have been held for the first cruise which is now scheduled to depart San Diego about January 30.

Cruise 1 will concentrate on gear and acoustic research. An approximate schedule and plan of research for the dedicated vessel has been prepared for the year of research activities.

Porpoise Gear Research Charters Completed

The tuna purse seiners, the Margaret L and the Marla Marie, completed cruises under charter to the National Marine Fisheries Service in December. The cruise on the Margaret L was directed primarily to the investigation of innovative gear and fishing techniques designed to influence porpoise movements. These included the use of bubble screens formed by releasing dry ice in the backdown channel and "flappers" consisting of overlapping triangular pieces of webbing which form a visual barrier that would yield under contact. The bubble screen was found to be potentially useful but the flappers proved unsatisfactory because the porpoise were reluctant to approach the webbing.

A study of stress physiology was begun on the charter cruise using blood samples collected from living and dead animals. This study will be continued aboard the dedicated vessel.

Because of the poor weather and fishing conditions certain planned studies had to be postponed such as the behavioral observations of the effects of prolonged holding on porpoise within the confines of the net. These studies will also be conducted on the dedicated vessel, a tuna seiner which is being provided by the tuna industry in 1978 for research on the porpoise/tuna interaction.

The vessel, Marla Marie, was the first of the smaller, Class II seiners, to test comparatively the super apron and the double depth safety panel. Although porpoise mortality levels were similar with each system, the super apron was found to be preferable operationally. Neither modification appeared to hamper conduct of normal fishing operations.

Workshop Meeting Held to Discuss Methodologies for Analyzing Porpoise Survey Data

The staff of the Marine Mammal Assessment and Monitoring Program held a second workshop meeting at the La Jolla Laboratory December 8 and 9, 1977 to discuss aspects of the line transect analysis of the aerial-research vessel porpoise population surveys of 1977. The workshop, chaired by Dr. Joseph Powers of the La Jolla Laboratory, was attended by Drs. William Perrin and David Au, and Lt. Wayne Perryman, NOAA Corps Officer detailed to the La Jolla Laboratory; Dr. Lee Eberhardts of the Marine Mammal Commission; Drs. David Anderson and Kenneth Burnham of the U.S. Fish and Wildlife Service; Dr. Robin Allen of the Inter-American Tropical Tuna Commission; Dr. David Burdick of the Porpoise Rescue Foundation; and Mr. Terry Quinn of the University of Washington. Discussions in the meeting produced methodologies by which the data may be appropriately analyzed and criteria set out for selecting among parallel methods in the process of estimating the sizes of porpoise populations in the eastern tropical Pacific.

Problems which were dealt with were: 1) the proper statistical model to use to define the area that was sampled, 2) bias in average school size and weighting of the sample to eliminate some of the bias, and 3) separation of an aggregate estimate of porpoise abundance into estimates by each species and/or stock.

A report on the population estimation encompassing the results of this workshop will be prepared by Dr. Powers for review of the workshop participants and ultimately for release to the general public. The results of this analysis will provide input to the assessment of the status of porpoise stocks and will guide the Center in plans for future aerial and vessel surveys in 1979.

TUNA RESOURCES PROGRAM

Biological Sampling of Foreign Imports of Atlantic Tunas Continues in Puerto Rico

Atlantic-caught tunas transshipped to Puerto Rico have been sampled routinely for biological information by Technician Eugene Holzapfel of the La Jolla Laboratory since March 1975. Data on fork length, weight and species composition were collected.

Results of sampling during the period January to December 1977 are as follows:

Species	Gear	No. of Samples	No. of Fish Sampled	Tonnage Sampled (MT)
Yellowfin	Baitboat	39	1,617	374
	Purse Seine	2	81	27
	Unknown	2	86	6
Skipjack	Baitboat	30	1,514	4,110
	Purse Seine	9	454	2,434
	Unknown	1	50	98
Bigeye	Baitboat	18	833	205
	Purse Seine	2	88	21
	Unknown	1	44	4
Albacore	Longline	4	200	655
TOTAL		108	4,967	7,934

PACIFIC ENVIRONMENTAL GROUP

OCEAN MODELING AND FORECASTING

At the fall meeting of the American Geophysical Union held in San Francisco on December 5-9, 1977, Oceanographer David Husby of PEG presented a paper entitled "Comparison of monthly merchant vessel data and ocean weather station data in calculations of air-sea energy transfer processes." This work is of importance because a part of PEG's mission is to infer ocean variability from atmospheric forcing parameters such as the wind stress, and the heat exchange across the sea surface.

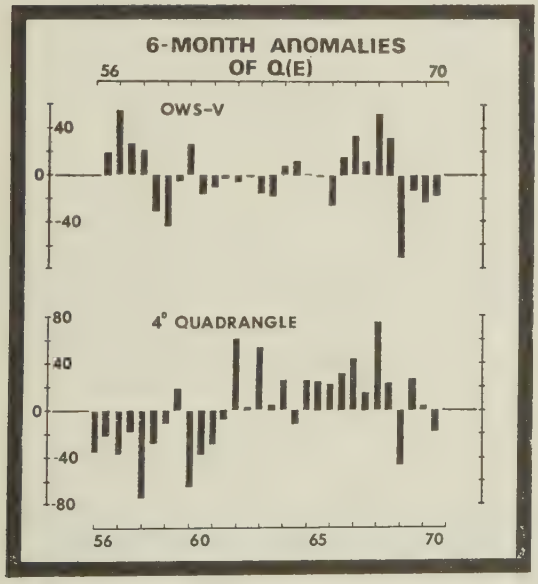
Under the World Meteorological Organization sponsorship weather observations are made around the globe on land as well as from merchant vessels at sea, four times a day, all at the same time. These weather data are collected by large weather centrals such as Fleet Numerical Weather Central to produce hemispherical or global "synoptic" weather charts every 6 hours. Over the oceans weather observations are not uniformly distributed with most of the data coming from the areas with heavily traveled shipping lanes. Nevertheless, the statistical techniques used provide reasonable pictures every day of the distribution of meteorological properties over the North Atlantic and North Pacific oceans. The snyoptic pressure distributions produced by Fleet Numerical Weather Central are regularly used by PEG to derive upwelling and other wind-induced flow indices that, in turn, are applicable to fishery problems.

In order to assess environment-fishery relationships it is also important that we can go back in time to derive atmospheric forcing parameters. Here, however, we meet up with difficulties because the marine meteorological data are archived by area (Marsden square) and not in the synoptic format. It is not possible to produce synoptic charts when the data are stored geographically. Monthly atmospheric forcing parameters therefore have usually been derived by computing mean values of meteorological properties for 5° quadrangles. This procedure can lead to distortions because merchant vessel data are irregularly distributed in space and in time.

In order to investigate this problem Husby compared the derived heat exchange processes based on Ocean Weather Station "V" data with those based on merchant vessel data in a 4° quadrangle centered about this station in the western North Pacific. He found that the long-term monthly means of the two sets were in good agreement. The pattern of seasonal anomalies, however, was different. To illustrate the differences 6-month anomalies from a 15 year mean of the heat used for evaporation (a large

term in the net heat exchange across the sea surface) are shown below. Note that in the 4° quadrangle anomalies tend to be negative before 1962 and positive after that year. A similar trend occurs in the difference of sea surface temperature between OWS-V and those from the 4° quadrangle. Differences in the anomaly pattern over and above this trend are attributed to the non-uniform distribution in time and space of the merchant vessel observations. OWS-V lies in an area of large sea-surface temperature variability and gradients which may accentuate the problem. However, there are many areas of interest to the fishery oceanographer with fewer than the 20 to 800 observations per 4° quadrangle per month in the study area.

The result of this investigation is disquieting, therefore, because the validity of seasonal anomalies of atmospheric forcing parameters derived from archived marine meteorological observations is in doubt when the traditional averaging procedures have been used. Uncertainties can be reduced by the use of objective analysis schemes that are being developed. In any case the development of reliable environmental indices for fisheries application is not a trivial scientific problem.



Six-month anomalies from the 1956-70 mean of the heat used for evaporation Q(E). Upper panel, values derived from Ocean Weather Station-"V" data. Lower panel, values derived from merchant vessel data in the 4° quadrangle surrounding OWS-V. Bars are for the October to March cooling and April to September heating portions of the annual cycle. Anomalies are expressed in calories cm^{-2} day^{-1}. Positive anomalies mean greater heat loss by evaporation.

TIBURON LABORATORY

FISH COMMUNITIES INVESTIGATION

Aging Studies of Rockfish Species Progresses

During this month Fishery Biologist Tina Echeverria at the Tiburon Laboratory completed aging studies on all specimens, collected to date of Sebastes mystinus and Sebastes flavidus, emphasizing a comparison of readability between scales and otoliths. For S. mystinus, the growth rings on the scales were easier to interpret, because secondary marks within larger zones that had been laid down during spawning and periodic feeding could easily be seen; these secondary marks were difficult to distinguish in otoliths. For S. flavidus, on the other hand, both scales and otoliths were easily read and were in agreement. Since otoliths are easier to prepare, they will be used in future determinations of age in this species.

Economist Attends Groundfish Team and Pacific Fisheries Management Council Meetings

Economist Edward Ueber, Tiburon Laboratory, attended meetings of the Groundfish Team and Pacific Management Council in Seattle, December 14-16. At these two meetings he presented a Request for Proposal for inventories of socio-economic information on the northwest groundfish fishery. At the request of the Council he expanded this document to include all fisheries covered by the Fisheries Management Plans, except salmon.

Paper on Fish-Plankton Interactions Presented

Dr. Edmund Hobson, Fishery Biologist at the Tiburon Laboratory, presented a paper entitled "Feeding interactions among fishes and plankton at Enewetak Atoll, Marshall Islands" at the annual meeting of the Western Society of Naturalists, held this year at the University of California, Santa Cruz on December 27.

FISHERIES DEVELOPMENT INVESTIGATION

Data Prepared for Salmon Pen-Rearing Workshop

Fishery Biologist R. Green reported that the salmon rearing pens were removed from the water for winter refurbishing, and preparations were begun for an imprinting experiment next year. Tagging and return data were worked up for analysis. Green has been preparing data for a salmon pen-rearing workshop organized by University of California Extension and scheduled for next February.

Five tags were returned, all from the latest November release of coho salmon. The fish were caught in the upper part of San Francisco Bay and near Santa Cruz.

San Francisco Bay Fisheries

By the end of December, Susan Smith and Susumu Kato of the Tiburon Laboratory had completed the manuscript "San Francisco Bay Fisheries--past, present and future." It was submitted to the editor of the San Francisco Bay Symposium, which was held last June, co-sponsored by the Western Division of AAS and Pacific Section of the American Society of Oceanography and Limnology. Target date for publication is early autumn 1978.

PHYSIOLOGY INVESTIGATIONS

Laboratory processing of striped bass samples collected during last year's experimental season was completed in December by members of the Striped Bass Task at the Tiburon Laboratory. This included measurements of larval striped bass morphometry, examination of measurements of stomach contents, oil globule volume, and dry weight determination of tissue and oil globules. These results and others are being analyzed to determine the effects of different food rations on striped bass larvae.

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A new culture container design was tested for suitability in rearing Pacific herring larvae. It consists of an 8-inch diameter plexiglass cylinder whose closed, recirculating design provides an even distribution of food organisms. Earlier this year, striped bass were successfully reared with high survival and fast growth rates. With further modifications it appears the container will meet the needs of clupeid larvae.

OCSEAP Petroleum Task

Dr. Jeannette Whipple and Tom Yocom of the Tiburon Laboratory traveled to the Northwest and Alaska Fisheries Center (NMFS) to participate in a progress report meeting sponsored by OCSEAP, November 29 to December 1. They presented results of research completed to date, and prepared a manuscript describing these results for publication in the meeting proceedings (NOAA Technical Report).

Following the meeting, Yocom remained in Seattle December 2 to participate in an Oil-Spill Response Workshop; he helped draft a section of a response document dealing with laboratory experiments to be conducted during or following an oil spill.

Whipple and Yocom also submitted a review of the Oil and Grease section of the EPA Water Quality Criteria ("Red Book"); this review is being published by the American Fisheries Society.

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Work continued at the Tiburon Laboratory on analysis of water and tissue samples from OCSEAP experiments. Previously unidentified compounds, detected in tissues at high part-per-million concentrations were found to be substituted cyclohexanes. These compounds were biomagnified many more times than aromatic hydrocarbons that have been identified as biologically hazardous. Techniques developed by staff personnel have thus uncovered a class of compounds, previously ignored, that are incorporated rapidly into tissues, retained in tissues longer than other aromatic hydrocarbons, and potentially of great importance in studies of effects of oil pollution.

PUBLIC AFFAIRS

Thirty graduate students from 18 countries in Africa, Asia, and Latin America who are attending various colleges and universities throughout the United States visited the Southwest Fisheries Center on December 28 for a lecture and tour of the facilities. The visit, arranged by Dr. Nancy Lo, was part of the annual mid-winter community seminar sponsored by the U.S. Agency for International Development (IIUHD). According to the local program coordinators, Drs. Jacqueline MacCalla and Faustino Escalera, Jr., the IIUHD is a "non-profit California corporation established for the purpose of advancing the ideal of the interdependence of people and interrelatedness of knowledge in a culturally pluralistic society."

Director Barrett greeted the students and accompanying IIUHD staff and welcomed them to the Center. Biological Technician Betsy Stevens discussed the overall research program conducted here and answered specific questions from the audience. Dr. Lo and L. Vlymen were tour guides.

PRESS RELEASES

The following press releases were issued by the Southwest Fisheries Center's Honolulu Laboratory in December.

December 21 - "Aggregation experiments show encouraging results."

- "Wheelchair no handicap to NOAA employee."

PERSONNEL

December 1 - Francine A. Yagawa, Data Transcriber, Temporary Appointment - Honolulu Laboratory

4 - Ronald Rinaldo, Fishery Biologist, Entered on Duty - La Jolla Laboratory

- Maureen Woods, Librarian, Promotion - Tiburon Laboratory

12 - Robert L. Humphreys, Biological Aid (Fisheries), Termination - Honolulu Laboratory

- Rebecca Morrow, Clerk-Typist, Entered on Duty - La Jolla Laboratory

18 - Bonnie Neece, Clerk-Steno, Entered on Duty - La Jolla Laboratory

- Richard Dyer, Computer Aid, Conversion to Career-Conditional, Part-Time - La Jolla Laboratory

- Stanley Moore, Computer Technician, Temporary Appointment - La Jolla Laboratory

- Margaret Domras, Administrative Clerk, Promotion - Pacific Environmental Group, Monterey

- Michael A. Barry, Fishery Biologist (General), Temporary Appointment - Honolulu Laboratory

- Victor A. Honda, Biological Technician (Fisheries), Promotion - Honolulu Laboratory

- Shoji Teramoto, Fishery Methods and Equipment Specialist, Reclassification and Promotion - Honolulu Laboratory

25 - Richard Butler, Fishery Methods and Equipment Specialist, Entered on Duty - La Jolla Laboratory

January 1 - Julie Dickson, Editorial Clerk, Promotion - La Jolla Laboratory

DAVID KRAMER
IN MEMORIAM
1918-1977

With profound regret, Director Barrett announced the death on December 17, 1977 of David Kramer, Fishery Biologist with the National Marine Fisheries Service, La Jolla Laboratory, and its predecessor agencies, since 1949.

Born in Boston, Massachusetts in 1918, David attended Clark University, Wooster, Massachusetts from which he graduated in 1944. After serving in the U.S. Army, he attended graduate school in marine biology at the University of Miami and in 1947 took a position as a biologist with the Texas A&M Research Foundation in Port Aransas, Texas. In 1949, he joined the U.S. Fish and Wildlife Service and was one of the first biologists recruited for the staff of the South Pacific Fishery Investigations housed in an old barracks building at the Scripps Field Annex on Pt. Loma. Working with the investigation chief, Dr. Elbert Ahlstrom, he helped compile biological data taken in plankton hauls during early cruises of the California Cooperative Oceanic Fisheries Investigations (CalCOFI).

In 1962, David was given an unusual assignment: to work with the architects in planning the details of a federal fisheries laboratory to be build on land deeded to the government by the Regents of the University of California. David approached this task with great interest and enthusiasm and it was in large part due to his devoted efforts that the buildings on the cliffs were constructed to be both functional and beautiful.

Author of 25 papers on fish and fisheries, David's principal research interests were in the growth and development of larval fishes. One of his most important and significant papers dealt with the development of the eggs and larvae of Pacific mackerel. At the time of his death, David was actively involved in a new and challenging project--the development of techniques for aging fishes using the newly-developed analysis of the daily growth rings on otoliths.

David was an enthusiastic amateur painter, photographer, and musician, a constant reader; in all, a man of wide and varied interests. He is survived by his wife of 30 years, Jane, a son and daughter and three grandchildren.

For almost three decades, David Kramer shared a close day to day association with his friends and colleagues at the Center. They knew him as a warm and caring human being, a true and loyal friend and a good and honorable scientist.

TRAINING

December 1 - Attending the U.S. Customs Service's Federal Women's Program Committee Workshop from the La Jolla Laboratory were Mesdames B. Engstrand, E. Sandknop and L. Prescott and Mr. P. Paloma.

5-9 - Ms. Margaret Domras, PEG, attended a Small Purchase Course held at the Naval Postgraduate School, Monterey, California.

August 22-December 14 - Susan Smith, Tiburon Laboratory, attended College of Marin, Kentfield, California enrolling in "General Zoology" and "Genetics and Evolution."

HONORS AND AWARDS

Honolulu Laboratory

Center Director Barrett presented Howard Yoshida with a 25-year service pin at a general staff meeting at the Honolulu Laboratory on December 1. Mr. Barrett also announced that Walter Matsumoto, who was on a cruise and not present at the meeting, had earned a 30-year service pin.

Yoshida was also presented a Special Achievement Award dated December 2.

Shoji Teramoto was awarded a quality step increase effective December 8.

La Jolla Laboratory

Quality Step Increase - Kate Coleman, Secretary, Coastal Fisheries Resources Division.

Cash Awards: Roy Allen, Illustrator; Dr. Dennis King, Economist; Merle Marrow, Maintenanceman; Dr. William Perrin, Fishery Biologist; Frank Ralston, Biological Technician.

VISITORS

Honolulu Laboratory

December 2 - Arthur Saltzman, Potomac Research Corporation, working under contract with the SWFC, met with Honolulu Laboratory Director Shomura and other Honolulu Laboratory

staff members to discuss a fishery information system to support activities of the Pacific and Western Pacific Councils.

December 2 - Barry Lanier, Living Marine Resources, Inc. (LMR), San Diego, met with Director Shomura concerning LMR's contract to evaluate fishery statistical systems in the central and western Pacific.

12 - Dr. S.N. Rao, Director of Fisheries, Kerala, India, and P.K. Eapen, Fisheries Cooperative Ltd., Ernakulam, India, visited Honolulu Laboratory. At the visitors' request Shomura arranged for their visit to the Hawaiian Tuna Packers and other places of interest.

- Dr. Jean Cramer, University of Hawaii, met with Shomura to report on the progress of her burnt tuna project.

13 - Mr. Araha Vala, fishery trainee from Papua New Guinea, met with Shomura to review progress of his training in Hawaii.

12-16 - Dr. George Fishman, University of North Carolina and Dr. Matthew Sobel, Georgia Institute of Technology, met with Dr. Roy Mendelssohn to discuss the northern anchovy contract work.

15 - Dr. Robert Kearney, Skipjack Programme Coordinator, South Pacific Commission, Noumea, New Caledonia.

20 - Dr. John J. Magnuson, University of Wisconsin.

La Jolla Laboratory

December 2 - William A. Sprigg, NOAA, Rockville, Maryland.

5 - Dr. Robert A. Skillman, NMFS, Honolulu Laboratory, Honolulu, Hawaii.

- Katherine Green, under contract to the Marine Mammal Commission to conduct a literature survey on the ecosystem of marine mammals, at Center for discussions with Drs. W. Fox, W. Perrin, R. Lasker, P. Smith and D. Gittings.

12 - Dr. Bruce Mate, Oregon State University, Corvallis, Oregon.

December 16 - Michael Perez, Marine Mammal Division, NMFS Northwest and Alaska Fisheries Center, Seattle, Washington.

19 - Drs. Matthew Gilligan, Chris Flanagan, D.A. Thomson, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona.

27 - Edgar A. Poe, Naval Environmental Support Office, Port Hueneme, California.

Pacific Environmental Group

December 2 - Dr. Preisendorfer, PMEL, NORPAX-Scripps Institution of Oceanography, La Jolla, California.

8 - Steve Piacsek, NORDA, Bay St. Louis, Ms.

- Dr. William Sprigg, NOAA, EM, Rockville, Md.

Tiburon Laboratory

December 2 - Bob McAllister, California Department of Fish and Game, Menlo Park, California.

- Bob Matus, California Department of Fish and Game, Menlo Park, California.

- David W. Schweid, California Department of Fish and Game, Menlo Park, California.

5 - M. Partridge, Jr., Commercial Fisherman, Corte Madera, California.

- Dave Gout, S.F. Seamasters, San Francisco, California.

12 - Gerald S. Kwiecien, Larkspur, California.

13 - Bob McAllister, California Department of Fish and Game, Menlo Park, California.

14 - Ed Jameyson, NMFS, Seattle, Washington.

22 - J. Michael Lyons, Florida State University, Tallahassee, Florida.

28 - William Jaeckle, College of Marin, Kentfield, California.

29 - Renold E. Narita, Fisheries Research Institute, University of Washington, Seattle, Washington.

December 29 - Lou Sabella, Sabella's of Marin, Tiburon, California (Restaurant)

SEMINARS

Honolulu Laboratory

December 6 - Dr. Andrew Dizon spoke on "Thermoregulation in yellowfin tuna" at the University of Hawaii.

La Jolla Laboratory

December 12 - Dr. Daniel D. Huppert, Economist presented a talk, "Methods and tactics in the development of the anchovy management plan"

19 - Dr. J.B.L. Mathews, Marine Biological Laboratory, University of Bergen, Bergen, Norway; "Searching for a trophic pattern in Korsfjorden, Western Norway."

MEETINGS AND TRAVEL

December 1 - Center Director I. Barrett spoke briefly on the recent Washington reorganization at a general staff meeting at the Honolulu Laboratory.

1-2 - Susumu Kato, Tiburon Laboratory, traveled to Long Beach, California to attend a meeting of the Squid Management Team of the Pacific Fisheries Management Council.

5 - Norman Abramson, Director, Tiburon Laboratory, attended a meeting on the Southwest Center-Southwest Region Fishery Information System at La Jolla, California.

5-7 - Andrew Bakun, David Husby and Gunter Seckel, PEG, traveled to San Francisco to attend the Fall Annual American Geophysical Union.

7 - Director R. Shomura of the Honolulu Laboratory reported on the baitfish and tuna aggregation projects at the Pacific Islands Fisheries Development Committee meeting called by Mr. Andy Gerakas, Chairman/President of the Pacific Tuna Development Foundation.

12-15 - Paul Sund, PEG, traveled to San Diego to attend the 2nd Conference on the Biology of Marine Mammals.

December 13 - Wally Giguere, Administrative Officer at the Tiburon Laboratory, attended a meeting of the Government Telecommunications Council in San Francisco.

14 - Shomura attended a meeting to discuss possible financial support of a project concerning ciguatoxin. Other participants included Dr. Stanley Swerdloff, Marine Affairs Coordinator's Office; Drs. A. Banner, P. Helfrich, and Y. Hokama, UH: Messrs. Kenji Ego and Henry Sakuda, State Division of Fish and Game (F&G); Messrs. Doyle E. Gates, Robert Iversen, and John Naughton, WPPO; and Messrs. Tamio Otsu and Richard Uchida, and Dr. Robert Skillman, Honolulu Laboratory.

14-15 - Director Barrett traveled to Seattle to participate in the meetings of the Pacific Regional Fishery Management Council's Scientific and Statistical Committee.

19-20 - Norm Abramson, Tiburon Laboratory, participated in a meeting of the Pink Shrimp Management Plan Development Team (PFMC) at the Northwest and Alaska Fishery Center in Seattle.

- Barrett in Monterey to discuss scientific and administrative matters with the Chief, Pacific Environmental Group and staff.

21 - Shomura met with Dr. Phil Helfrich, University of Hawaii; Mr. Henry Sakuda, F&G; and Mr. Wilvan Van Campen, WPRFMC to discuss a spiny lobster research proposal submitted to the WPRFMC for financial support.

27-28 - Barrett and David Mackett, Program and Planning Officer, met with Gerald Howard, Regional Director and his staff at Terminal Island for budget and planning sessions, and to develop a Region-Center Fisheries Development program. Director Shomura of the Honolulu Laboratory also participated in these discussions.

Nationald Data Management Meeting
Held at SWFC

The National Data Management Committee met at the Southwest Fisheries Center in La Jolla, December 6 and 7. This group is responsible for providing advice on the technical aspects of information and data systems development to the NMFS Office of Information Systems (OIS). Committee members include representatives appointed jointly by each Center/Regional Director, and a representative of Environmental Data systems. Committee chairman is Dr. Hoyt Wheeland, OIS.

Shown left to right are: James DeLine, Vice President of DBD Systems, Inc., Guest Speaker; Eric Groess, Southeast Fisheries Center, Miami; Fred Brooks, OIS, Washington, D.C.; David Mackett, Southwest Fisheries Center; Richard Heimann, California Department of Fish and Game, Menlo Park, California; Raymond Tillery, OIS, Washington, D.C.; Fred Kellenberger, Southwest Fisheries Center; Robert Reimann, Northwest and Alaska Fisheries Center, Seattle, Washington; Dr. Wheeland; Eugene Heyerdahl, Northeast Fisheries Center. Mr. Newton Page, Environmental Data Service was absent from the picture.

Almost one-half day of the two-day meeting at the Center was given over to a review of the Southwest Center and Regional programs and a review of the SW Center's Data Base Management efforts. Dr. Wheeland presented a progress report on the Fishery Information Network (FISHNET) and the systems on FISHNET such as the Enforcement Management Information System, Marine Mammal/Endangered Species Permit System, and budget information. The national-level information systems operated on FISHNET consist principally of those that deal with system management information. Mr. Tillery discussed the data dictionary/directory system and Mr. Mackett talked about computer conferencing.

UNITED STATES
DEPARTMENT OF COMMERCE

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